BIDIRECTIONAL SOLAR ENERGY METER

YENEPOYA INSTITUTE OF TECHNOLOGY

Dept. of ECE

STUDENT NAME	Email id	Mobile number
Vishwas T R	vishwasrpoojari2001@gmail.com	93532113754
Varun	varunsv12@gmail.com	8861446049
Ambaldhage Sudheendra	ambaldhagesudheendra2002@gmail.com	7989644719
Vinodraj S R	vinodrajsr2001@gmail.com	9743897648

Guide:-

Nazia A.M. -nazia@yit.edu.in-8549018993

KEYWORDS:-

NodeMCU :- node micro-controller unit

IOT:- Internet Of Things

PV solar panel:- Photovoltaic solar panel

INTRODUCTION

A bidirectional solar energy meter with database is a device that measures the amount of energy generated by a solar panel system and tracks the flow of energy in both directions - from the solar panels to the grid and vice versa. It allows the homeowner or business owner to accurately monitor and manage their energy usage and production.

The device has two measurement channels, one for measuring the energy generated by the solar panels and another for measuring the energy consumed from the grid. The meter collects data on a real-time basis and stores it in a database. This information can be used to analyze energy consumption patterns, identify inefficiencies, and optimize energy usage.

The bidirectional solar energy meter with database has several benefits, including helping homeowners and businesses save money on their energy bills, reducing their carbon footprint, and improving energy efficiency. Additionally, it can help utility companies manage their grid more effectively and ensure a stable power supply.

The bidirectional solar energy meter is equipped with state-of-the-art sensors and communication capabilities that enable it to measure the real-time energy production and injection from solar panels to the grid, as well as the energy consumption from the grid. The meter collects data on energy generation, consumption, and injection, and stores it in a database for further analysis and management.

The built-in database in the bidirectional solar energy meter allows for comprehensive data logging and reporting, providing valuable insights into solar energy production and usage patterns. The data can be accessed remotely through a user-friendly interface, enabling users to monitor and manage their solar energy system effectively.

OBJECTIVE

A bidirectional meter is capable of measuring both the incoming and outgoing electricity flow, which is important for tracking net energy usage. By measuring the net energy usage, the meter can determine how much excess energy is being generated by the solar panel system and how much energy is being imported from the grid.

The inclusion of a database allows for the storage and analysis of energy usage data over time. This data can be used to optimize the solar panel system for maximum efficiency and to identify areas where energy conservation measures can be implemented.

By tracking energy production and consumption data over time, the database allows for in-depth analysis of the solar power system's performance. It helps identify patterns, trends, and anomalies, enabling users to optimize energy usage, improve system efficiency, and diagnose any potential issues.

METHODOLOGY

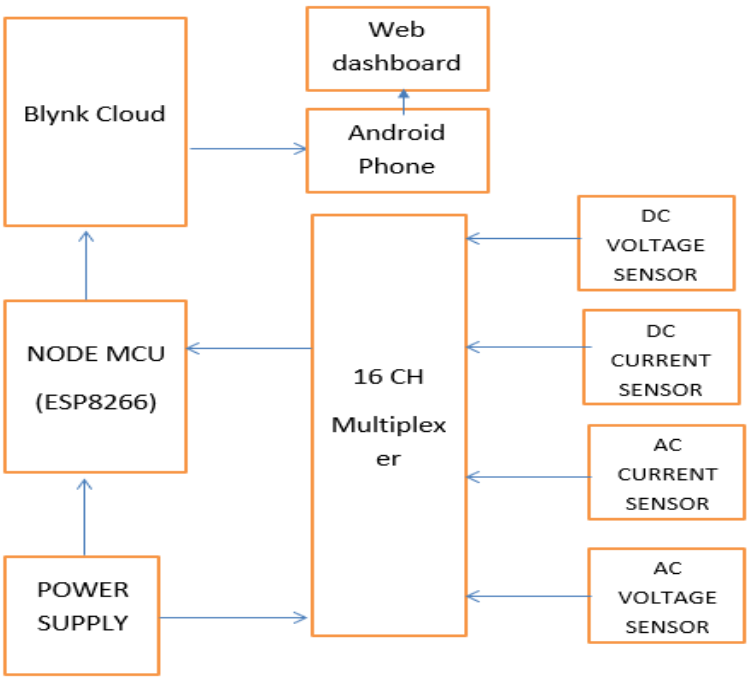


Fig 1. Block diagram of Bidirectional Solar Energy Meter

The system mainly consists of the sensors that could measure the voltage and the current here, mainly the hall effect type SCT 013 Sensor is used to measure the current in the DC production and AC delivery lines .The same way the voltage sensors are used to measure the voltage across the DC And AC lines .These data's are communicated to the node mcu which in turn has the code to execute the required parameters .The processed data is transferred to the Cloud data base in our case Blynk, and here the data's are displayed in real time and also stored an can be extracted in the form of report as per the users requirement .The user also has the access to delete the data in case of resetting the energy meter.

The process of transferring the data into the cloud takes place over the internet with the help of the wifi hotspot that can be provided with the mobile phone and the router. The data here is safe and will not be access to the other users unless with the unique authentication key.

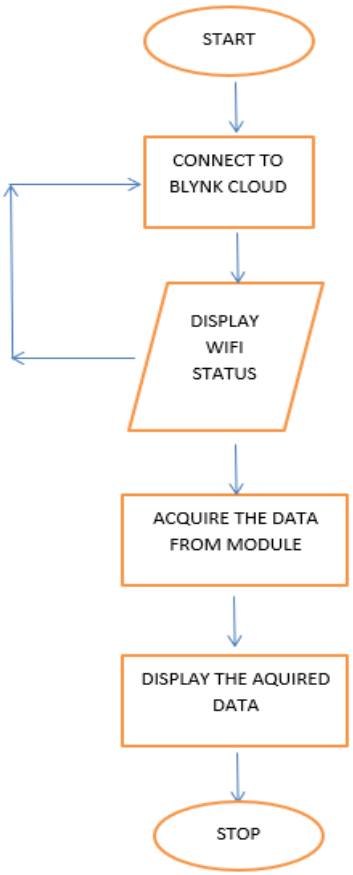


Fig 2. Flowchart of Bidirectional Solar Energy Meter

As shown in figure 2 initially system will be connected to blink cloud using an app which is built, then the Wi-Fi status is checked and displayed. After displaying Wi-Fi status the data is acquired from the module and displays the value.

CIRCUIT DIAGRAM

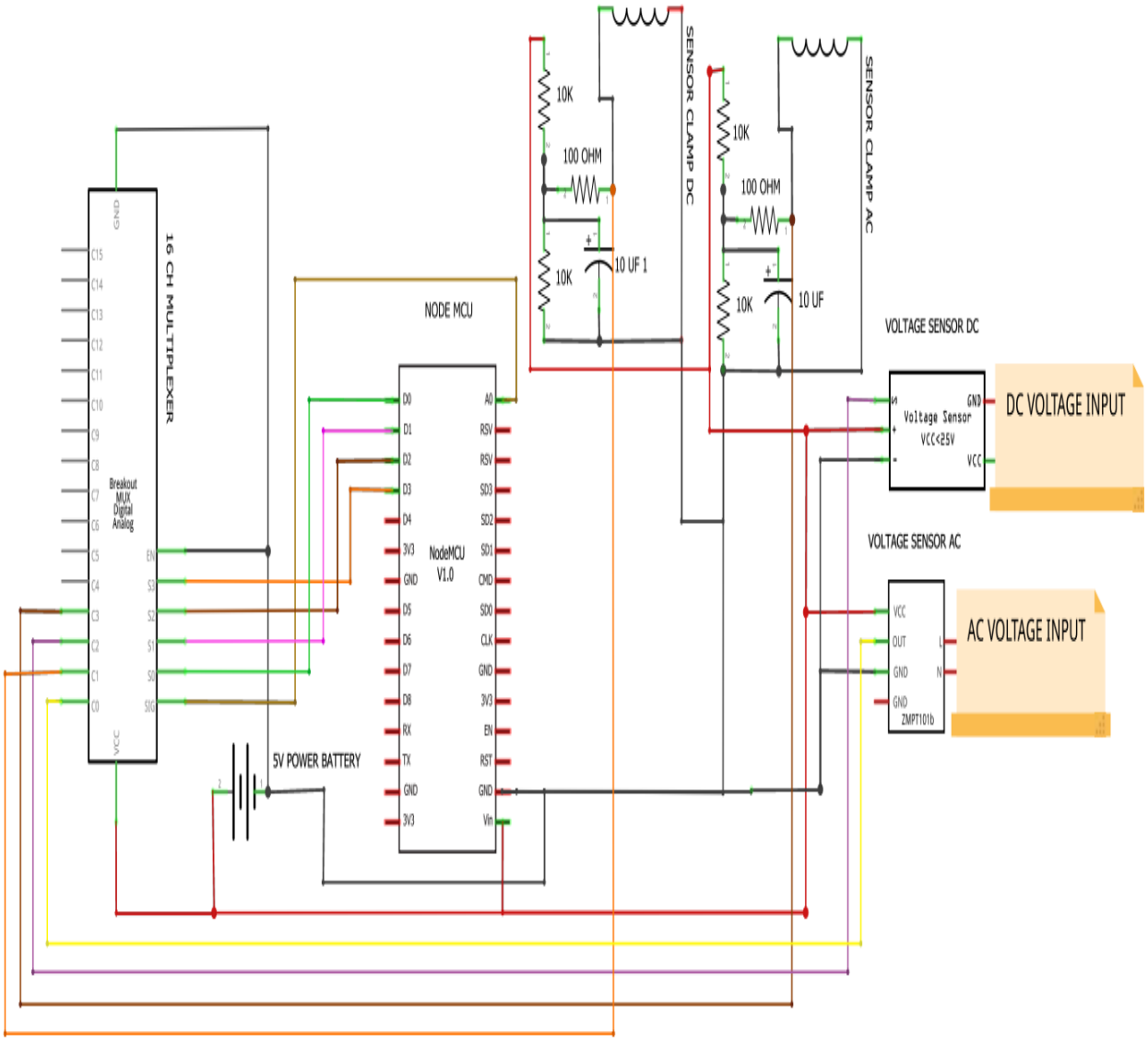


Fig 3. Circuit diagram of Bidirectional Solar Energy Meter

Presently the Energy Meter is a very useful device that measures and records important

information of electrical parameters. Commercial DC or AC Energy Meters are single direction meter which could only measure and record values in one direction. Uni-directional one-way one-direction Energy Meter is sufficient for typical household and DC power generation but it is not suitable for system that involves forward and backward current flow such as in Solar panel Application. For off-grid PV System, the battery bank (DC) involves charging and discharging DC current while on-grid PV System involves import and export AC current to the Grid Utility. If the system use a typical 1 way Energy Meter to measure the 2-directional current flow, the meter might either filtered out the reverse current readings or may have error on the meter.

.

RESULT

The device measures the energy generated by the solar panel and consumed for the utility purpose and sent to grid. It measures DC current, DC voltage, AC current, AC voltage, power imported and exported. The measured data stored in the cloud is displayed through mobile application from the dashboard. The accuracy of the system is nearly 85 percent when it's measured with multi meter.

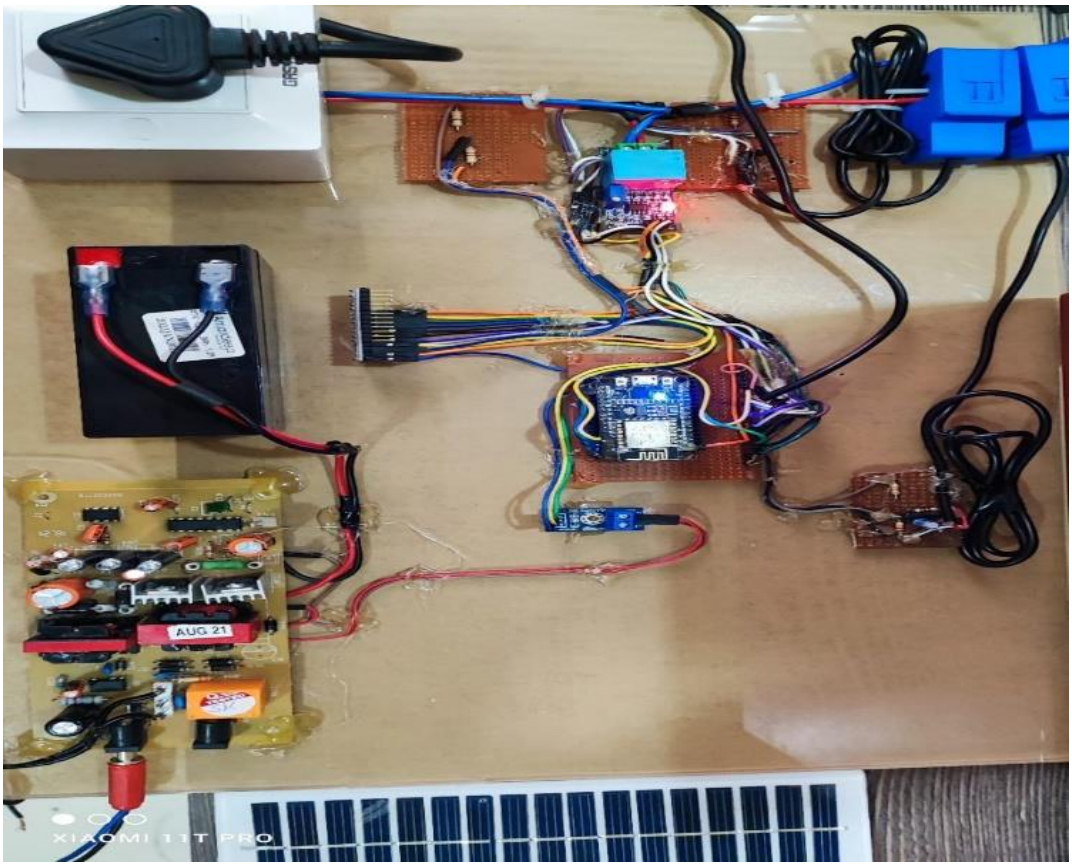
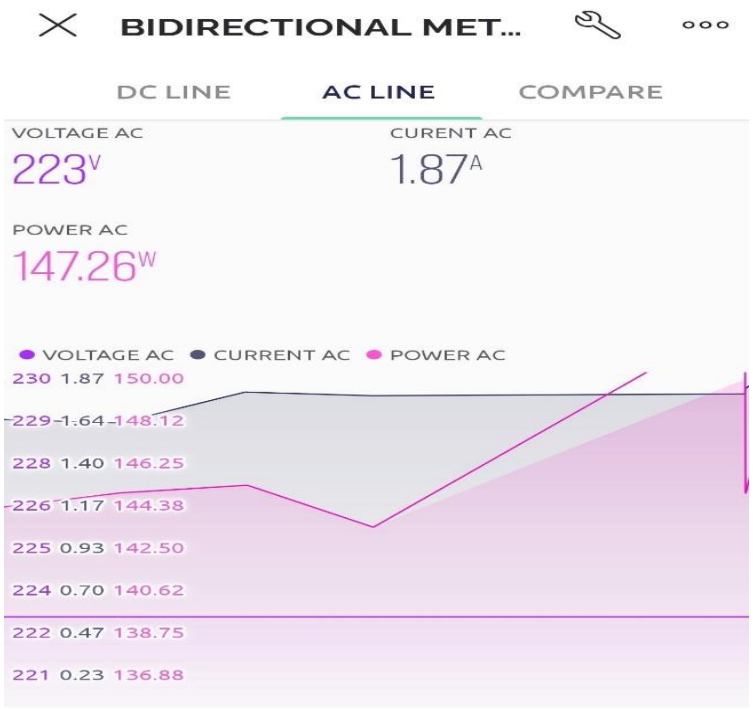


Fig 4. Setup of Bidirectional Solar energy meter



AC voltage, current and power measurement

Fig 5. DC voltage, current and power measurement

Fig 6. Imported and Exported power

CONCLUSION

The system is a useful for monitoring and managing energy consumption and production in a residential or commercial solar energy system. With this system, users can track the amount of energy generated by their solar panels, as well as the amount of energy consumed from the grid and the amount of excess energy fed back into the grid.

The inclusion of a database allows for the storage and analysis of energy usage data over time, which can provide insights into energy consumption patterns and help identify areas for energy efficiency improvements. This can help users save money on energy bills and reduce their carbon footprint.

WHAT IS INNOVATION OF THE PROJECT ?

The meter with an intuitive user interface that displays relevant information such as energy consumption, generation, and financial data. This interface could be in the form of an LCD display, mobile app, or web portal, making it easier for users to understand and manage their energy usage.

FUTURE SCOPE

A bidirectional solar energy meter with a database can accurately measure the energy generated by the solar panels and the energy consumed by the household or business. The database can store this information and provide detailed insights into the energy usage patterns, peak hours, and peak demands.

This information can help individuals and businesses optimize their energy usage and reduce their energy bills. It can also help utilities and grid operators to better manage the distribution of energy and ensure a stable and reliable supply of electricity.

In addition, the system with a database can also be used to track the carbon footprint of households and businesses, allowing them to make informed decisions about their energy consumption and environmental impact.

As the world moves towards a more sustainable future and the use of renewable energy sources becomes more widespread, the demand for accurate and reliable energy monitoring systems is

only going to increase. It has a bright future in this industry and is likely to play an important role in shaping the energy landscape in the years to come.